University of Tripoli Faculty of Engineering

Electrical & Electronic Engineering Department

EE463 2nd Exam Time: 1:30 hr Fall 2017 16/12/2017

Q1) Temperature sensor sensitivity is 0.42mA/ °C , used for temperature range (± 50 °C)
Design signal condition circuits for bipolar (8 bit) ADC with voltage reference ±3V.

a) What is the digital output of ADC at the temperature 31 °C, -20 °C

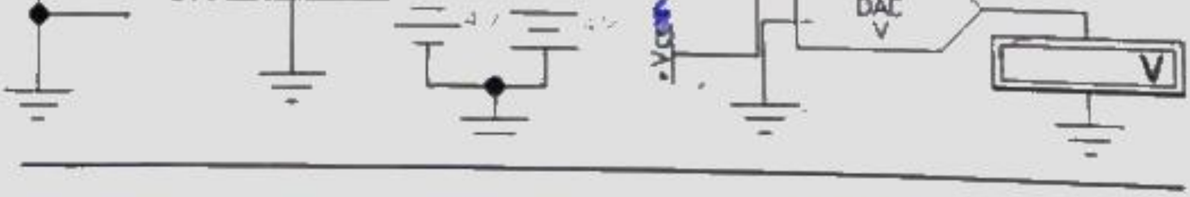
b) What is the temperature when the digital output is B6H. [10 pts]

Q2) Design the signal conditioning circuits to connect the sensor to 8 bit ADC with voltage reference (0~10V), where: sensor output range (-100 ~ +100 mV) with frequency 25Hz, Noise signal 20mV with frequency 260Hz, and using filter that Attenuate the noise signal to 29% of its value, and taking in account the effect of the filter on the sensor signal. [10 pts]

Q3) Using pressure sensor which sensitivity is 2.3mV/bar, and temperature sensor which sensitivity is 10Ω/°C and its value at zero °C =300Ω. Design circuit which open Valve when the pressure is more than 15bar , and operate heater when temperature is less than 20 °C, and operate Red LED when both of them are ON. [10 pts]

20 Ω RTD 10 Ω/°C

Q4) What is the digital value of the ADC output and what is the analog value of DAC output at the temperature 23 °C, and -30 °C. Where sensor sensitivity=15mV/ °C, sensor output at 0 °C=100mV, sensor range=±50 °C [10 pts]



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256 128 64 32 16 8 4 2 1

Good Luck (Zeyad)

Fall 2017

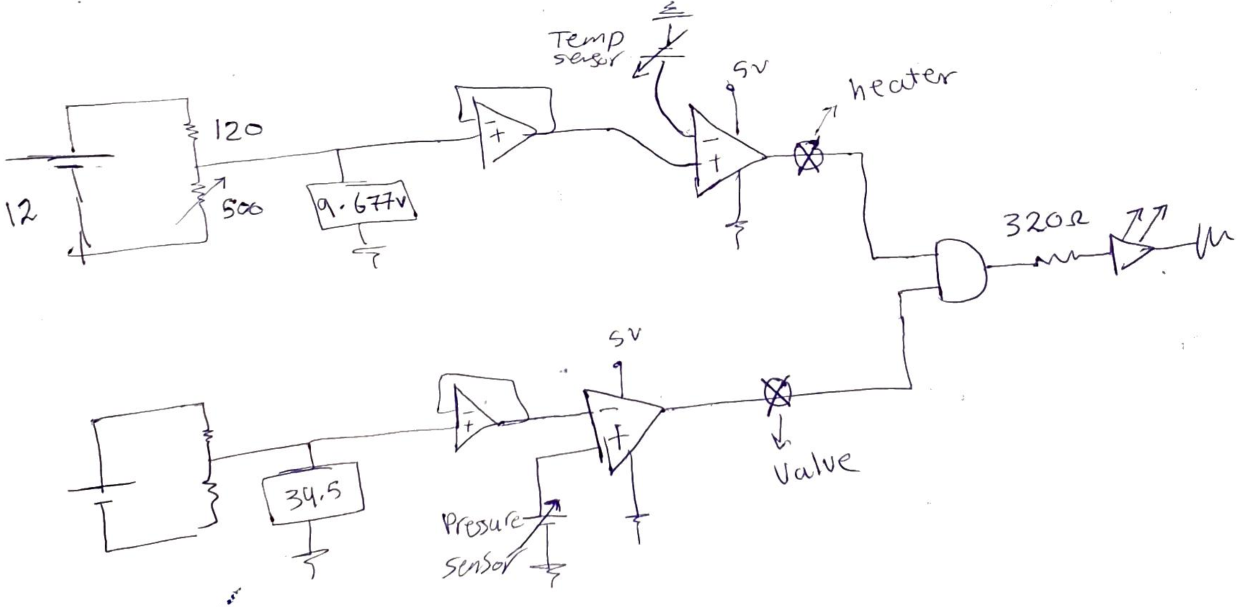
2nd Exam

Q3 - Pressure sensor sensitivity is $2.3 \frac{mV}{bar}$

Temp " " is $10 \frac{\Omega}{C^\circ}$ $@0^\circ C = 300\,\Omega$

* Open Value when $P > 15$ bar,
* operate heater " $T < 20^\circ c$,
* Red led when both ON.

- $15\,bar \times 2.3 \frac{mV}{bar} = 34.5\,mV$
- $\left(20^\circ c \times \frac{10\,\Omega}{C^\circ}\right) + 300\,\Omega = 500\,\Omega$



Temp sensor
5V
heater
120
500
12
9.677V
320Ω
5V
Valve
34.5
Pressure sensor

A	B	C
0	0	0
0	1	0
1	0	0
1	1	1

$$R_{Red} = \frac{5-1.8V}{10mA} = 320\,\Omega$$